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(54) RESIN COMPOSITION FOR REFLECTOR

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a material for reflector satisfying various kinds of requested physical properties in a high level and capable of suitably being used as a reflector.

SOLUTION: This resin composition for reflector is characterized by comprising 30-95 wt.% of a semiaromatic polyamide having ≥ 20 mol% ratio of the aromatic monomer in the total monomeric components and 5-70 wt.% of potassium titanate fiber and/or wollastonite.

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CLAIMS

[Claim(s)]

[Claim 1] The resin constituent for reflecting plates characterized by containing 30 - 95 % of the weight of half-aromatic polyamide, the potassium titanate fiber, and/or 5 - 70 % of the weight of straw SUTONAITO whose rate of the aromatic series monomer in [all] a monomer component is more than 20 mol %.

[Claim 2] The resin constituent for reflecting plates according to claim 1 said whose half-aromatic polyamide is the half-aromatic polyamide which contains aromatic series dicarboxylic acid and aliphatic series alkylene diamine as a monomer component [claim 3] The resin constituent for reflecting plates according to claim 2 said whose half-aromatic polyamide is the half-aromatic polyamide which contains aliphatic series dicarboxylic acid as a monomer component further.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the resin constituent for reflecting plates which can be suitably used as reflecting plate (reflector) ingredients for luminescence equipments, such as a light emitting diode component (it is called "LED" Light Emission Diode and the following).

[0002]

[Description of the Prior Art] Since diversification of the luminescent color and high brightness luminescence were attained by improvement in the LED engine performance in recent years, the adoption to various kinds of luminescence equipments which employed the thing with the small energy expenditure and calorific value efficiently has spread. The conventional electric bulb alternative application is mentioned as one of the such application expansions. This luminescence equipment usually inserts, pastes up or attaches diode to the reflecting plate which comes to fabricate synthetic resin, and is manufactured by closing with closure ingredients, such as an epoxy resin. Since the LED reflecting plates used for such luminescence equipment are important components which influence the engine performance of LED, various examination is made also about the ingredient. The high rate of a light reflex and the rate of protection from light are first required of the charge of LED reflecting plate material. moreover, an LED reflecting plate — about 1-2mm very detailed **** — since it considers as the mold goods of a complicated minute configuration in many cases, the good fabrication nature which can reproduce a desired configuration precisely with injection molding etc. is needed for the ingredient. Furthermore, since an LED reflecting plate has a possibility minute very minutely and intricately of it not coming to accept it but reducing the rate of a light reflex also by slight deformation, if the ingredient is not the thing excellent in a mechanical strength or dimensional stability, it will not become. In addition, for a certain reason, high thermal resistance is also required also for the opportunity exposed to elevated temperatures, such as soldering to the closure, the circuit board, etc. by the epoxy resin. Thus, although, as for an LED reflecting plate, the various physical properties like the above are required, it asks for these physical properties also in reflecting plates for luminescence equipments other than LED.

[0003] On the other hand, the resin constituent which blends a glass fiber with melting workability polyester, such as aromatic polyester and aromatic series polyester amide, and comes to blend titanium oxide as a charge of reflecting plate material if needed further is proposed (JP,6-38520,B). Although thermal resistance and the dimensional stability of this resin constituent are to some extent good, white degree is not enough and there is a fault that the rate of a light reflex is low. Although a potassium titanate fiber and straw SUTONAITO are also mentioned to this official report as an inorganic fiber in which the combination of those other than a glass fiber is possible, even if it uses these inorganic fibers, sufficient rate of a light reflex cannot be obtained in combination with melting workability polyester.

[0004] Moreover, the resin constituent (JP,3-84060,A) which blended 10 - 50 % of the weight of titanium oxide and 0.3 - 30 % of the weight of denaturation polyolefines with the resin constituent (JP,59-113049,A) containing 10 - 40 % of the weight of aromatic polyester, 15 - 55 % of the weight of polyamides, 15 - 45 % of the weight of polycarbonates, and 10 - 30 % of the weight of titanium oxide, the resin constituent (JP,2-288274,A) which consists of 60 - 95 % of the weight (Nylon 46) of polyamides and 5 - 40 % of the weight of titanium oxide, and the matrix resin which consists of polyester and a polyamide be proposed However, these resin constituents have molding shrinkage and a large coefficient of linear expansion, and especially, since the coefficient of linear expansion at the time of an elevated-temperature load is large, they have the fault that dimensional stability is bad. Furthermore, in the rate of a light reflex, or the rate of protection from light, it cannot be satisfied enough. That is, although the conventional charge of reflecting plate material is the level which can be satisfied about some physical properties for which it asks as a reflecting plate, it has the trouble that it is not what can be satisfied in other physical properties.

[0005] Then, this invention fulfills excellently the various physical properties for which it asks in view of the above-mentioned conventional trouble, and makes it a technical problem to offer the charge of reflecting plate material which can be suitably used as a reflecting plate.

[0006]

[Means for Solving the Problem] As a result of repeating research wholeheartedly that the above-mentioned technical problem should be solved, this invention person succeeded in obtaining the resin constituent suitable for the charge of reflecting plate material, and completed this invention. That is, this invention requires the rate of the aromatic series monomer in [all] a monomer component for the resin constituent for reflecting plates characterized by containing 30 - 95 % of the weight of half-aromatic polyamide, the potassium titanate fiber, and/or

5 – 70 % of the weight of straw SUTONAITO which is more than 20 mol %.

[0007] The physical properties for which it asks in the rate of a light reflex, white degree, fabrication nature, a mechanical strength, dimensional stability, thermal resistance, and hygroscopicity, without spoiling the useful physical properties which this half-aromatic polyamide has by blending a specific inorganic fiber with the above-mentioned half aromatic polyamide according to this invention are filled with a high level, and the resin constituent which can maintain high white degree is offered especially, without causing discoloration, even if it excels in protection-from-light nature and is exposed to an elevated temperature. If an inorganic fiber is blended with synthetic resin, it is known that a mechanical strength, dimensional stability, thermal resistance, etc. will improve, but while this invention does such effectiveness so, protection-from-light nature does so further the outstanding effectiveness of being notably high, especially with the combination of the above-mentioned half aromatic polyamide, and a potassium titanate fiber and straw SUTONAITO. The resin constituent of this invention which has the above outstanding physical properties is useful as a reflecting plate ingredient, especially a charge of LED reflecting plate material.

[0008]

[Embodiment of the Invention] In this invention, half-aromatic polyamide means the polyamide containing an aromatic series monomer as a monomer component of a polyamide. the aromatic series monomer in the monomer component from which the half-aromatic polyamide used as a matrix constitutes a polyamide in this invention — more than 20 mol % — it is 30–60–mol %, and 280 degrees C or more of melting points are more than 25 mol % and the half-aromatic polyamide which is 280–320 degrees C more preferably preferably. Here, the mole fraction of the monomer in aromatic polyamide can be adjusted by making the rate of the monomer in a polymerization raw material into a predetermined mole fraction.

[0009] As an aromatic series monomer, aromatic series diamine, aromatic series dicarboxylic acid, an aromatic series amino carboxylic acid, etc. can be mentioned, for example. As aromatic series diamine, as aromatic series dicarboxylic acid, a terephthalic acid, isophthalic acid, a phthalic acid, 2-methyl terephthalic acid, naphthalene dicarboxylic acid, etc. are mentioned, and p-phenylene diamine, o-phenylenediamine, m-phenylenediamine, paraxylene diamine, meta-xylene diamine, etc. are mentioned for p-aminobenzoic acid etc. as an aromatic series amino carboxylic acid, for example. Also in these, aromatic series dicarboxylic acid is desirable. An aromatic series monomer can use one sort independently, or can use two or more sorts together. As monomer components other than an aromatic series monomer, aliphatic series dicarboxylic acid, aliphatic series alkylene diamine, alicyclic alkylene diamine, an aliphatic series amino carboxylic acid, etc. can be mentioned.

[0010] As aliphatic series dicarboxylic acid, an adipic acid, a sebacic acid, an azelaic acid, dodecane diacid, etc. can be mentioned. Also in these, an adipic acid is desirable. Aliphatic series dicarboxylic acid can use one sort independently, or can use two or more sorts together. Aliphatic series alkylene diamine may be a straight chain-like, or may be branched-chain. Specifically, ethylenediamine, trimethylene diamine, a tetramethylenediamine, pentamethylene diamine, a hexamethylenediamine, 1, 7-diamino heptane, 1, 8-diamino octane, 1, 9-diamino nonane, 1, 10-diamino decane, 2-methyl pentamethylene diamine, 2-ethyl tetramethylenediamine, etc. can be mentioned. Also in these, a hexamethylenediamine, 2-methyl pentamethylene diamine, etc. are desirable. Aliphatic series alkylene diamine can use one sort independently, or can use two or more sorts together.

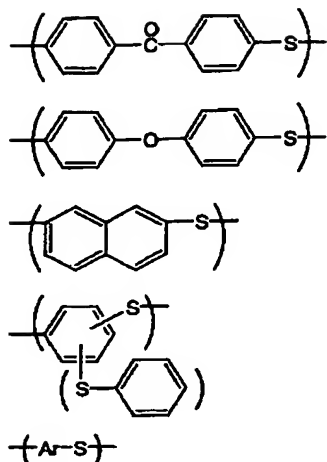
[0011] As alicyclic alkylene diamine, the 1, 3-diamino cyclohexane, 1, 4-diamino cyclohexane, 1, 3-screw (aminomethyl) cyclohexane, screw (aminomethyl) cyclohexane, screw (4-amino cyclohexyl) methane, 4, and 4'-diamino -3, 3'-dimethyl dicyclohexyl methane, isophorone diamine, a piperazine, etc. can be mentioned, for example. Alicyclic alkylene diamine can use one sort independently, or can use two or more sorts together.

[0012] As an aliphatic series amino carboxylic acid, 6-aminocaproic acid, 11-amino undecanoic acid, 12-amino dodecanoic acid, etc. can be mentioned, and the annular lactam corresponding to these may be used, for example. An aliphatic series amino carboxylic acid can use one sort independently, or can use two or more sorts together. Also in these monomer components, aliphatic series dicarboxylic acid, aliphatic series alkylene diamine, etc. are desirable. These monomer components can use one sort independently, or can use it together two or more sorts.

[0013] Also in the above-mentioned half-aromatic polyamide, the thing containing aromatic series dicarboxylic acid and aliphatic series alkylene diamine, the thing containing aromatic series dicarboxylic acid, aliphatic series dicarboxylic acid, and aliphatic series alkylene diamine, etc. are desirable. Also in such half-aromatic polyamide, that whose dicarboxylic acid is the mixture of a terephthalic acid, a terephthalic acid, and isophthalic acid or the mixture of a terephthalic acid, isophthalic acid, and an adipic acid is desirable. Especially in said two sorts of mixture, the thing beyond 40 mol % has the desirable rate of a terephthalic acid. Furthermore, especially the thing whose aliphatic series alkylene diamine is the mixture of a hexamethylenediamine or a hexamethylenediamine, and 2-methyl pentamethylene diamine is desirable also in such half-aromatic polyamide. In half-aromatic polyamide, especially, although it is desirable, what copolymerized 50 mol % of terephthalic acids, hexamethylenediamine 25 mol %, and 2-methyl pentamethylene diamine 25 mol % can be mentioned as an example. By choosing suitably the percentage and the class of an aromatic series monomer or other monomer components which constitute half-aromatic polyamide, the melting point, glass transition temperature, etc. can be adjusted suitably.

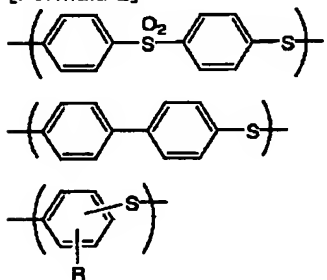
[0014] this invention — if it is, polyphenylene sulfide may be used with half-aromatic polyamide as matrix resin of a resin constituent. a thing well-known as polyphenylene sulfide — each — it can be used — moreover, a line — you may be which structures, such as structure and the structure of cross linkage. For example, the crystalline polymer which contains as a component the repeat unit shown by the following general formulas can be mentioned.

[Formula 1]



Ar shows 1, 4-phenylene group, 1, and 3-phenylene group or 1, and 2-phenylene group among [type.]
 [0015] the thing which uses the above-mentioned repeat unit as a principal component in this invention, i.e., the thing which consists only of the above-mentioned repeat unit, and this — desirable — more than 80 mol % — more — desirable — 90-mol % — what is included is desirable. When the substantial whole quantity of polyphenylene sulfide does not consist of the above-mentioned repeat unit, the remainder can be copolymerized, for example, can be made to satisfy of the component which consists of the following repeat units.

[Formula 2]



R shows an alkyl group, an alkoxy group, a nitro group, or a phenylene group among [type.]

[0016] In this invention, a commercial item may be used as polyphenylene sulfide. As a commercial item, toe PUREN (a trade name, product made from toe PUREN), Ryton (a trade name, Toray Industries, Inc. make), FO TRON (a trade name, Polyplastics make), etc. can be mentioned, for example.

[0017] this invention — setting — the loadings of a matrix resin component — this resinous principle — half-aromatic polyamide — the case where it is concomitant use with half-aromatic polyamide and polyphenylene sulfide when independent — including — the resin constituent whole quantity — it takes for 40 - 70 % of the weight 30 to 90% of the weight preferably 30 to 95% of the weight. When it separates from the range whose loadings of a resinous principle are 30 - 95 % of the weight, there is a possibility that the resin constituent which filled with the high level the various physical properties needed for a reflecting plate may not be obtained. In addition, preferably, although the blending ratio of coal of these resin in the case of using together half-aromatic polyamide and polyphenylene sulfide can be chosen suitably, half-aromatic polyamide should just blend so that the total quantity of these resin may be contained 50 to 80% of the weight more preferably 40 to 90% of the weight.

[0018] In this invention, a potassium titanate fiber and/or straw SUTONAITO are used as an inorganic fiber blended with the mixture of half-aromatic polyamide or this aromatic polyamide, and polyphenylene sulfide. As a potassium titanate fiber, there is especially no limit, and a well-known thing can be used widely conventionally, for example, 4 potassium titanate fibers, 6 potassium titanate fibers, 8 potassium titanate fibers, etc. can be used. Although especially a limit does not have the dimension of a potassium titanate fiber, it is [usually and 0.01-1 micrometer of diameters of average fiber] 3-30 micrometers preferably 0.1-0.5 micrometers and 1-50 micrometers of mean fiber length. In this invention, a commercial item can also be used, for example, TISUMO (a trade name, the product made from Otsuka Chemistry, 0.2-0.5 micrometers of diameters of average fiber, 5-30 micrometers of mean fiber length) etc. can be used. Straw SUTONAITO is an inorganic fiber which consists of a meta-calcium silicate. although especially a limit does not have the dimension of straw SUTONAITO, either — usually — 0.1-15 micrometers of diameters of average fiber — desirable — 2.0-7.0 micrometers and 3-180 micrometers of mean fiber length — desirable — 20-100 micrometers and three or more average aspect ratios — desirable — 3-50 — it is 5-30 more preferably. A commercial item can be suitably used also as straw SUTONAITO, for example, BAISUTARU K101 (a trade name, the product made from Otsuka Chemistry, micrometers [of diameters of average fiber / 2-5], 5-30 micrometers of mean fiber length), NyglosI-10013 (a trade name, the product made from Nyco, 5-30 micrometers of diameters of average fiber, 5-30 micrometers of mean fiber length), etc. can be used. When the rate of protection

from light and white degree of a resin constituent which are obtained are taken into consideration also in these, a potassium titanate fiber is desirable.

[0019] In this invention, in order to raise further physical properties, such as a mechanical strength of the resin constituent obtained, surface treatment may be performed to a potassium titanate fiber and straw SUTONAITO. What is necessary is just to perform surface preparation using a silane coupling agent, a titanium coupling agent, etc. according to a well-known approach. Also in these, a silane coupling agent is desirable and especially an amino silane is desirable.

[0020] It is usually good to make [of the resin constituent whole quantity] more preferably the loadings of a potassium titanate fiber and/or straw SUTONAITO into 20 – 60 % of the weight (resinous principle: 40 – 80 % of the weight) five to 70% of the weight ten to 70% of the weight (resinous principle: 30 – 90 % of the weight). When it separates from 5 – 70% of the weight of the range, there is a possibility that the resin constituent which filled with the high level the various physical properties needed for a reflecting plate may not be obtained.

[0021] In this invention, it is the range which does not spoil the various desirable physical properties of a resin constituent, and in order to raise further the rate of a light reflex, protection-from-light nature, etc. especially, titanium oxide may be blended. When using straw SUTONAITO as an inorganic fiber especially, it is desirable to use titanium oxide together. Although two or more sorts of things from which it is not restricted especially as titanium oxide, but each thing of various crystalline forms, such as an anatase mold, a rutile mold, and a monoclinic system mold, can be used, and a crystalline form differs can also be used together, a rutile mold with sufficient light stability with a high refractive index is desirable. Moreover, there is especially no limit also about the configuration of titanium oxide, each thing of various configurations, such as the shape of a particle, fibrous, and tabular (the shape of the shape of a thin film integrated circuit and a scale and a mica etc. is included), can be used, and two or more sorts of things from which a configuration differs can also be used together. Although especially a limit does not have the dimension of titanium oxide, that whose mean particle diameter is about 0.1–0.3 micrometers is desirable. Moreover, what gave various finishing agents may be used. Although what is necessary is just to choose suitably in the range which especially the loadings of titanium oxide are not restricted, but its reflective effectiveness improves, and moreover does not spoil the desirable physical properties of a resin constituent. Usually, 1 – 40% of the weight of the resin constituent whole quantity (resinous principle: 30 to 94% of the weight) potassium titanate fiber and/or straw SUTONAITO: — 5 – 69-% of the weight extent — desirable — 5 – 30-% of the weight (resinous principle: 30 – 90-% of the weight, potassium titanate fiber, and/or straw SUTONAITO: 5–65 % of the weight) extent — then, it is good.

[0022] A potassium titanate fiber and well-known inorganic fibers other than straw SUTONAITO may be blended with the resin constituent of this invention in the range which does not spoil the desirable physical properties. It is not limited especially as this inorganic fiber, for example, zinc oxide fiber, titanate-acid sodium fiber, boric-acid aluminum fiber, boric-acid magnesium fiber, magnesium-oxide fiber, aluminum silicate fiber, silicon nitride fiber, etc. can be mentioned. An antioxidant, a thermostabilizer, etc. may be blended with the resin constituent of this invention in the range which does not spoil the desirable physical properties.

[0023] As an antioxidant, a phenolic antioxidant, the Lynn system antioxidant, a sulfur system antioxidant, etc. can be mentioned. As a phenolic antioxidant, for example A triethylene glycol screw [3-(3-t-butyl-5-methyl-4-hydroxyphenyl) propionate], A 1,6-hexanediol screw [3-(3, 5-G t-butyl-4-hydroxyphenyl) propionate], Pentaerythrityl-tetrakis [3-(3, 5-G t-butyl-4-hydroxyphenyl) propionate], Octadecyl-3-(3, 5-G t-butyl-4-hydroxyphenyl) propionate, 3 5-G t-butyl-4-hydroxybenzyl FOSUFONETO-diethyl ester, N and N'-hexa methylenebis (3 5 - G t-butyl-4-hydroxy-hydronalium thinner MAMIDO), 1, 3, 5-trimethyl -2, 4, 6-tris (3, 5-G t-butyl-4-hydroxybenzyl) benzene, 3 and 9-screw [2-{3-(3-t-butyl-4-hydroxy-5-methylphenyl) propionyloxy}-1 and 1-dimethyl ethyl]-tetraoxaspiro [2, 4, 8, and 10-] [5, 5] undecane etc. can be mentioned. Also in these, pentaerythrityl tetrakis [3-(3, 5-G t-butyl-4-hydroxyphenyl) propionate], N, and N'-hexa methylenebis (3 5 - G t-butyl-4-hydroxy-hydronalium thinner MAMIDO) is desirable. As an example of the Lynn system anti-oxidant, for example A tris (2, 4-G t-buthylphenyl) FOSU fight, 2-[[2, 4 and 8, 10-tetrakis (1 and 1-dimethyl ETERU) dibenzo [d, f] [— 1 and 3 — 2] dioxa FOSUFEBIN 6-IRU] oxy-]-N and N-screw [2-[[2, 4, 8, and 10-tetrakis (1, 1 dimethyl ethyl) dibenzo [d, f] [1, 3, 2] dioxa FOSUFEBIN 6-IRU] oxy-]-ethyl] ethanamine, Screw (2, 6-G t-butyl-4-methylphenyl) pentaerythrityldiphosphite etc. can be mentioned. Also in these 2-[[2, 4 and 8, 10-tetrakis (1 and 1-dimethyl ETERU) dibenzo [d, f] [— 1 and 3 — 2] dioxa FOSUFEBIN 6-IRU] oxy-]-N and N-screw [2-[[2, 4, 8, and 10-tetrakis (1, 1 dimethyl ethyl) dibenzo [d, f] [1, 3, 2] dioxa FOSUFEBIN 6-IRU] oxy-]-ethyl] ethanamine is desirable. As an example of a sulfur system anti-oxidant, they are a 2 and 2-thio-diethylene screw [3-(3, 5-G t-butyl-4-hydroxyphenyl) propionate] and tetrakis, for example. [Methylene-3-(dodecyl thio) propionate] methane etc. can be mentioned. These antioxidants can use one sort independently, or can use two or more sorts together.

[0024] Furthermore, one sort of the various additives used for synthetic resin from the former or two sorts or more can be blended with the resin constituent of this invention in the range which does not spoil the desirable physical properties. As this additive, inorganic fillers, such as talc, a silica, and a zinc oxide (the thing of a tetrapod configuration is included), a flame retarder, a plasticizer, a nucleating additive, a color, a pigment, a release agent, an ultraviolet ray absorbent, etc. can be mentioned, for example.

[0025] The resin constituent of this invention can manufacture other additives by carrying out melting mixing according to a well-known approach with aromatic polyamide, straw SUTONAITO, and/or a potassium titanate fiber if needed further. Each well-known melting mixing equipment, such as a twin screw extruder, can use it for melting mixing. The resin constituent of this invention can be fabricated to various reflecting plates by the well-known resin fabricating methods, such as an injection-molding method, compression forming, and an extrusion method.

[0026] The reflecting plate obtained in this way can be suitably used as reflecting plates for luminescence equipments, such as luminescence equipment used for outdoor displays, such as optical-communication equipments, such as various kinds of electric electronic parts, the keyless entry system of an automobile, the lighting in a refrigerator warehouse, the back light of a liquid crystal display, an automobile front panel lighting system, a lighting stand, a bed light, home-electronics indicators, and an infrared communication device, a head-lining lighting system, and a traffic sign, etc.

[0027]

[Example] An example and the example of a comparison are given to below, and this invention is concretely explained to it. In addition, the synthetic resin and the inorganic fiber which were used in the example of this example comparison are specifically as follows.

[Synthetic resin]

Half-aromatic-polyamide A: Half-aromatic polyamide to which it comes to carry out the polymerization of a hexamethylenediamine, a terephthalic acid, and the adipic acid at 50-mol % and 32-mol % of a rate, respectively (a trade name "AMODERU A4000", Du Pont make) [% and 18 mol]

Half-Aromatic-polyamide B: Half-aromatic polyamide which comes to carry out the polymerization of 2-methyl pentamethylene diamine, a hexamethylenediamine, and the terephthalic acid at 25-mol % and 25-mol % of a rate, respectively (a trade name "Zytel HTN501", the Du Pont make, melting point of 305 degrees C, glass transition temperature of 125 degrees C) [% and 50 mol]

Polyphenylene sulfide : (it is called "PPS" a trade name "Ryton M2888", the Toray Industries, Inc. make, and the following)

Aromatic polyester : (it is called "LCP" the product made from trade name "Vectra C950" Polyp Lastic, and the following)

[0028] [Inorganic fiber]

Straw SUTONAITO : (the product made from trade name "BAISUTARU K101" Otsuka Chemistry, 2-5 micrometers of diameters of average fiber, 20-30 micrometers of mean fiber length)

Potassium titanate fiber : (the product made from trade name "TISUMO D101" Otsuka Chemistry, fiber length of 10-20 micrometers, 0.3-0.6 micrometers of diameters of fiber)

Powdered titanium oxide : (a trade name "JR-405", the TAYCA CORP. make, mean particle diameter of 0.21 micrometers)

Chopped glass fiber : (it is called "GF" the product made from "ECS 03T 294-/Trade name PL" NEC Glass, and the following.)

[0029] the potassium titanate fiber or straw SUTONAITO from the side feeder after supplying half-aromatic polyamide or half-aromatic polyamide, and PPS to the Maine hopper of a 2 shaft kneading extruder by the blending ratio of coal (% of the weight) shown in examples 1-8 and the example 1 of a comparison - the 4 following table 1 and carrying out melting kneading at 330 degrees C — titanium oxide was added further, melting kneading was carried out, it extruded, and the pellet of the resin constituent of this invention was manufactured.

[0030]

[Table 1]

	実 施 例								比 較 例							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
半芳香族ポリアミドA	50	50	50	35	—	—	—	—	50	35	—	—	—	—	—	—
半芳香族ポリアミドB	—	—	—	—	50	50	50	35	—	15	50	35	—	—	—	—
PPS	—	—	—	15	—	—	—	15	—	—	—	15	50	—	—	—
LCP	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50
チタン酸カリウム繊維	50	30	—	—	50	30	—	—	—	—	—	—	—	—	—	—
グラスナイト	—	—	30	30	—	—	30	30	—	—	—	—	30	30	—	—
GF	—	—	—	—	—	—	—	—	30	30	30	30	—	—	—	—
酸化チタン	—	20	20	20	—	20	20	20	20	20	20	20	20	20	20	20
引張強さ(MPa)	183	176	138	117	191	171	130	116	132	119	130	121	131	91	—	—
引張破断伸び(%)	2.5	2.7	2.4	2.1	2.4	2.6	2.1	1.8	2.4	2	2.2	1.8	2.1	1.4	—	—
曲げ強さ(MPa)	339	257	217	181	331	278	236	186	195	149	200	155	174	141	—	—
曲げ弾性率(GPa)	15.3	12.0	10.7	11.0	16.5	13.1	11.5	12.7	10.3	10.1	11	10.7	14.5	14.3	—	—
IZOD衝撃値(J/m)	49	45	39	35	42	48	39	34	47	40	45	39	37	20	—	—
HDT(°C)	285	281	280	270	250	245	245	242	285	275	250	248	232	223	—	—
線膨張係数($\times 10^{-5}/^{\circ}\text{C}$) MD	1.5	2.3	2.5	2.4	1.1	1.8	2.0	1.9	2.1	2.0	1.6	1.8	1.9	2.1	—	—
TD	5.0	4.7	4.6	4.6	3.5	3.3	3.2	3.2	5.7	5.7	4.0	4.1	3.2	3.0	—	—
TD/MD	3.3	2.0	1.8	1.9	3.2	1.8	1.6	1.7	2.7	2.9	2.7	2.6	1.7	1.4	—	—
Q値($\times 10^{-2}\text{cm}^3$)	2.4	1.2	1.1	4.9	9.6	8.2	8.1	14	0.5	2.9	5.5	9.2	15.3	3.2	—	—
吸水性 (%)	0.2	0.2	0.19	0.14	0.1	0.1	0.09	0.07	0.21	0.15	0.15	0.1	0.02	0.03	—	—
ハンター白度	○	○	○	○	○	○	○	○	△	△	○	○	×	×	×	×
耐熱変色試験後	△	△	○	△	○	○	○	○	×	×	○	○	×	×	×	×
光透過率(450nm)(%)	○	○	○	○	○	○	○	○	△	△	△	△	○	○	—	—
(530nm)(%)	○	○	○	○	○	○	○	○	×	×	×	×	○	○	—	—
(630nm)(%)	○	○	○	○	○	○	○	○	×	×	×	×	○	○	—	—

[0031] the pellet of the resin constituent of this invention obtained above — JIS test piece production — public funds — it supplied to the injection molding machine (a trade name "JS75", Japan Steel Works Make, 330 degrees C of cylinder temperatures) equipped with a mold (die temperature of 130 degrees C), injection molding was carried

out to it, various JIS test pieces were manufactured, and the following performance tests were presented.

- (1) Tensile strength and **** elongation after fracture : JIS It measured according to K7113.
- (2) Bending strength and a bending elastic modulus : JIS It measured according to K7271.
- (3) The Izod (IZOD) impact resistance value with a notch : JIS According to K7110, it evaluated with the No. 1 test piece.
- (4) HDT(heat resistance test):JIS According to K7207, the load deflection temperature (HDT, **) when adding bending stress 1.82MPa was measured.
- (5) Coefficient of linear expansion : TAM120 apparatus for thermomechanical analysis (a trade name "SSC5200H disk TESHON", Seiko Instruments make) was used, and the coefficient of linear expansion of 20-130 degrees C was measured. The direction of taking over was set to MD, and the direction of a right angle was set to TD. in order to consider as the index of an anisotropy — the ratio of the coefficient of linear expansion of MD and TD — TD/MD was indicated.
- (6) flow rate (Q value): — a quantity-ized type flow tester — using it — examples 1-8 and the examples 1-4 of a comparison — 330x9.8MPa — moreover, in 310x9.8MPa, the example 9 of a comparison made remaining-heat time amount 360 seconds, respectively, and measured 290 degree-Cx9.8MPa and the example 10 of a comparison by 10mm in 1mm of orris apertures, and thickness.
- (7) Water absorption : JIS It measured according to K7209.
- (8) Brightness by Hunter : it measured using the color difference meter by Nippon Denshoku Co., Ltd. moreover, evaluation — for O and 89 or more [less than 91], ** and 85 or more [less than 89] were indicated to be x, and 85 or less were indicated [93 or more white degree / O and 91 or more / less than 93] to be xx.
- (9) Heat-resistant discoloration trial : the oven in 180 degree-Cx 2-hour air performed the heat-resistant discoloration trial, and white degree was measured like (8).
- (10) Light transmission : the sample made into the shape of a film of 100-micrometer thickness with the vacuum press machine was measured according to U-recording spectrophotometer by Hitachi, Ltd. 3000 form, and the permeability of 460nm, 530nm, and 630nm was indicated. Evaluation indicated O and 3% or more to be **s less than 5%, and O and 0% or more were indicated to be x for 0% of permeability 5% or more less than 3%. These results are shown in Table 1.

[0032] From the result of Table 1, the resin constituent of this invention sets to a mechanical strength, thermal resistance, coefficient of linear expansion (dimensional stability), a fluidity (fabrication nature), white degree, thermochromism, and light transmission, The physical properties demanded as a reflecting plate are filled with a high level, especially light transmission falls greatly compared with the examples 1-4 of a comparison which used glass fiber, and is remarkably inferior in white degree further for the own amorous glance of base resin in the examples 5 and 6 of a comparison using other heat resistant resin, such as PPS and LCP, and it is in ** that the direction of a constituent given in this example is excellent.

[0033]

[Effect of the Invention] As mentioned above, the resin constituent for reflecting plates concerning this invention fills with a high level the various physical properties for which it asks as a reflecting plate, and does so the effectiveness that it can be suitably used as a reflecting plate.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the resin constituent for reflecting plates which can be suitably used as reflecting plate (reflector) ingredients for luminescence equipments, such as a light emitting diode component (it is called "LED" Light Emission Diode and the following).

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EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, the resin constituent for reflecting plates concerning this invention fills with a high level the various physical properties for which it asks as a reflecting plate, and does so the effectiveness that it can be suitably used as a reflecting plate.

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TECHNICAL PROBLEM

[Description of the Prior Art] Since diversification of the luminescent color and high brightness luminescence were attained by improvement in the LED engine performance in recent years, the adoption to various kinds of luminescence equipments which employed the thing with the small energy expenditure and calorific value efficiently has spread. The conventional electric bulb alternative application is mentioned as one of the such application expansions. This luminescence equipment usually inserts, pastes up or attaches diode to the reflecting plate which comes to fabricate synthetic resin, and is manufactured by closing with closure ingredients, such as an epoxy resin. Since the LED reflecting plates used for such luminescence equipment are important components which influence the engine performance of LED, various examination is made also about the ingredient. The high rate of a light reflex and the rate of protection from light are first required of the charge of LED reflecting plate material. moreover, an LED reflecting plate — about 1-2mm very detailed **** — since it considers as the mold goods of a complicated minute configuration in many cases, the good fabrication nature which can reproduce a desired configuration precisely with injection molding etc. is needed for the ingredient. Furthermore, since an LED reflecting plate has a possibility minute very minutely and intricately of it not coming to accept it but reducing the rate of a light reflex also by slight deformation, if the ingredient is not the thing excellent in a mechanical strength or dimensional stability, it will not become. In addition, for a certain reason, high thermal resistance is also required also for the opportunity exposed to elevated temperatures, such as soldering to the closure, the circuit board, etc. by the epoxy resin. Thus, although, as for an LED reflecting plate, the various physical properties like the above are required, it asks for these physical properties also in reflecting plates for luminescence equipments other than LED.

[0003] On the other hand, the resin constituent which blends a glass fiber with melting workability polyester, such as aromatic polyester and aromatic series polyester amide, and comes to blend titanium oxide as a charge of reflecting plate material if needed further is proposed (JP,6-38520,B). Although thermal resistance and the dimensional stability of this resin constituent are to some extent good, white degree is not enough and there is a fault that the rate of a light reflex is low. Although a potassium titanate fiber and straw SUTONAITO are also mentioned to this official report as an inorganic fiber in which the combination of those other than a glass fiber is possible, even if it uses these inorganic fibers, sufficient rate of a light reflex cannot be obtained in combination with melting workability polyester.

[0004] Moreover, the resin constituent (JP,3-84060,A) which blended 10 - 50 % of the weight of titanium oxide and 0.3 - 30 % of the weight of denaturation polyolefines with the resin constituent (JP,59-113049,A) containing 10 - 40 % of the weight of aromatic polyester, 15 - 55 % of the weight of polyamides, 15 - 45 % of the weight of polycarbonates, and 10 - 30 % of the weight of titanium oxide, the resin constituent (JP,2-288274,A) which consists of 60 - 95 % of the weight (Nylon 46) of polyamides and 5 - 40 % of the weight of titanium oxide, and the matrix resin which consists of polyester and a polyamide be proposed However, these resin constituents have molding shrinkage and a large coefficient of linear expansion, and especially, since the coefficient of linear expansion at the time of an elevated-temperature load is large, they have the fault that dimensional stability is bad. Furthermore, in the rate of a light reflex, or the rate of protection from light, it cannot be satisfied enough. That is, although the conventional charge of reflecting plate material is the level which can be satisfied about some physical properties for which it asks as a reflecting plate, it has the trouble that it is not what can be satisfied in other physical properties.

[0005] Then, this invention fulfills excellently the various physical properties for which it asks in view of the above-mentioned conventional trouble, and makes it a technical problem to offer the charge of reflecting plate material which can be suitably used as a reflecting plate.

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MEANS

[Means for Solving the Problem] As a result of repeating research wholeheartedly that the above-mentioned technical problem should be solved, this invention person succeeded in obtaining the resin constituent suitable for the charge of reflecting plate material, and completed this invention. That is, this invention requires the rate of the aromatic series monomer in [all] a monomer component for the resin constituent for reflecting plates characterized by containing 30 - 95 % of the weight of half-aromatic polyamide, the potassium titanate fiber, and/or 5 - 70 % of the weight of straw SUTONAITO which is more than 20 mol %.

[0007] The physical properties for which it asks in the rate of a light reflex, white degree, fabrication nature, a mechanical strength, dimensional stability, thermal resistance, and hygroscopicity, without spoiling the useful physical properties which this half-aromatic polyamide has by blending a specific inorganic fiber with the above-mentioned half aromatic polyamide according to this invention are filled with a high level, and the resin constituent which can maintain high white degree is offered especially, without causing discoloration, even if it excels in protection-from-light nature and is exposed to an elevated temperature. If an inorganic fiber is blended with synthetic resin, it is known that a mechanical strength, dimensional stability, thermal resistance, etc. will improve, but while this invention does such effectiveness so, protection-from-light nature does so further the outstanding effectiveness of being notably high, especially with the combination of the above-mentioned half aromatic polyamide, and a potassium titanate fiber and straw SUTONAITO. The resin constituent of this invention which has the above outstanding physical properties is useful as a reflecting plate ingredient, especially a charge of LED reflecting plate material.

[0008]

[Embodiment of the Invention] In this invention, half-aromatic polyamide means the polyamide containing an aromatic series monomer as a monomer component of a polyamide. the aromatic series monomer in the monomer component from which the half-aromatic polyamide used as a matrix constitutes a polyamide in this invention — more than 20 mol % — it is 30-60-mol %, and 280 degrees C or more of melting points are more than 25 mol % and the half-aromatic polyamide which is 280-320 degrees C more preferably preferably. Here, the mole fraction of the monomer in aromatic polyamide can be adjusted by making the rate of the monomer in a polymerization raw material into a predetermined mole fraction.

[0009] As an aromatic series monomer, aromatic series diamine, aromatic series dicarboxylic acid, an aromatic series amino carboxylic acid, etc. can be mentioned, for example. As aromatic series diamine, as aromatic series dicarboxylic acid, a terephthalic acid, isophthalic acid, a phthalic acid, 2-methyl terephthalic acid, naphthalene dicarboxylic acid, etc. are mentioned, and p-phenylene diamine, o-phenylenediamine, m-phenylenediamine, paraxylene diamine, meta-xylene diamine, etc. are mentioned for p-aminobenzoic acid etc. as an aromatic series amino carboxylic acid, for example. Also in these, aromatic series dicarboxylic acid is desirable. An aromatic series monomer can use one sort independently, or can use two or more sorts together. As monomer components other than an aromatic series monomer, aliphatic series dicarboxylic acid, aliphatic series alkylene diamine, alicyclic alkylene diamine, an aliphatic series amino carboxylic acid, etc. can be mentioned.

[0010] As aliphatic series dicarboxylic acid, an adipic acid, a sebacic acid, an azelaic acid, dodecane diacid, etc. can be mentioned. Also in these, an adipic acid is desirable. Aliphatic series dicarboxylic acid can use one sort independently, or can use two or more sorts together. Aliphatic series alkylene diamine may be a straight chain-like, or may be branched-chain. Specifically, ethylenediamine, trimethylene diamine, a tetramethylenediamine, pentamethylene diamine, a hexamethylenediamine, 1, 7-diamino heptane, 1, 8-diamino octane, 1, 9-diamino nonane, 1, 10-diamino decane, 2-methyl pentamethylene diamine, 2-ethyl tetramethylenediamine, etc. can be mentioned. Also in these, a hexamethylenediamine, 2-methyl pentamethylene diamine, etc. are desirable. Aliphatic series alkylene diamine can use one sort independently, or can use two or more sorts together.

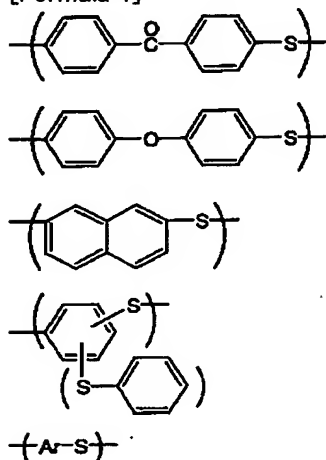
[0011] As alicyclic alkylene diamine, the 1, 3-diamino cyclohexane, 1, 4-diamino cyclohexane, 1, 3-screw (aminomethyl) cyclohexane, screw (aminomethyl) cyclohexane, screw (4-amino cyclohexyl) methane, 4, and 4'-diamino -3, 3'-dimethyl dicyclohexyl methane, isophorone diamine, a piperazine, etc. can be mentioned, for example. Alicyclic alkylene diamine can use one sort independently, or can use two or more sorts together.

[0012] As an aliphatic series amino carboxylic acid, 6-aminocaproic acid, 11-amino undecanoic acid, 12-amino dodecanoic acid, etc. can be mentioned, and the annular lactam corresponding to these may be used, for example. An aliphatic series amino carboxylic acid can use one sort independently, or can use two or more sorts together. Also in these monomer components, aliphatic series dicarboxylic acid, aliphatic series alkylene diamine, etc. are desirable. These monomer components can use one sort independently, or can use it together two or more sorts.

[0013] Also in the above-mentioned half-aromatic polyamide, the thing containing aromatic series dicarboxylic acid and aliphatic series alkylene diamine, the thing containing aromatic series dicarboxylic acid, aliphatic series dicarboxylic acid, and aliphatic series alkylene diamine, etc. are desirable. Also in such half-aromatic polyamide, that whose dicarboxylic acid is the mixture of a terephthalic acid, a terephthalic acid, and isophthalic acid or the mixture of a terephthalic acid, isophthalic acid, and an adipic acid is desirable. Especially in said two sorts of mixture, the thing beyond 40 mol % has the desirable rate of a terephthalic acid. Furthermore, especially the thing whose aliphatic series alkylene diamine is the mixture of a hexamethylenediamine or a hexamethylenediamine, and 2-methyl pentamethylene diamine is desirable also in such half-aromatic polyamide. In half-aromatic polyamide, especially, although it is desirable, what copolymerized 50 mol % of terephthalic acids, hexamethylenediamine 25 mol %, and 2-methyl pentamethylene diamine 25 mol % can be mentioned as an example. By choosing suitably the percentage and the class of an aromatic series monomer or other monomer components which constitute half-aromatic polyamide, the melting point, glass transition temperature, etc. can be adjusted suitably.

[0014] this invention — if it is, polyphenylene sulfide may be used with half-aromatic polyamide as matrix resin of a resin constituent. a thing well-known as polyphenylene sulfide — each — it can be used — moreover, a line — you may be which structures, such as structure and the structure of cross linkage. For example, the crystalline polymer which contains as a component the repeat unit shown by the following general formulas can be mentioned.

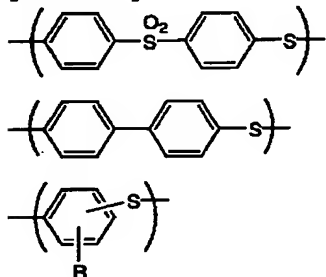
[Formula 1]



Ar shows 1, 4-phenylene group, 1, and 3-phenylene group or 1, and 2-phenylene group among [type.]

[0015] the thing which uses the above-mentioned repeat unit as a principal component in this invention, i.e., the thing which consists only of the above-mentioned repeat unit, and this — desirable — more than 80 mol % — more — desirable — 90-mol % — what is included is desirable. When the substantial whole quantity of polyphenylene sulfide does not consist of the above-mentioned repeat unit, the remainder can be copolymerized, for example, can be made to satisfy of the component which consists of the following repeat units.

[Formula 2]



R shows an alkyl group, an alkoxy group, a nitro group, or a phenylene group among [type.]

[0016] In this invention, a commercial item may be used as polyphenylene sulfide. As a commercial item, toe PUREN (a trade name, product made from toe PUREN), Ryton (a trade name, Toray Industries, Inc. make), FO TRON (a trade name, Polyplastics make), etc. can be mentioned, for example.

[0017] this invention — setting — the loadings of a matrix resin component — this resinous principle — half-aromatic polyamide — the case where it is concomitant use with half-aromatic polyamide and polyphenylene sulfide when independent — including — the resin constituent whole quantity — it takes for 40 - 70 % of the weight 30 to 90% of the weight preferably 30 to 95% of the weight. When it separates from the range whose loadings of a resinous principle are 30 - 95 % of the weight, there is a possibility that the resin constituent which filled with the high level the various physical properties needed for a reflecting plate may not be obtained. In addition, preferably, although the blending ratio of coal of these resin in the case of using together half-aromatic polyamide and polyphenylene sulfide can be chosen suitably, half-aromatic polyamide should just blend so that the total quantity of these resin

may be contained 50 to 80% of the weight more preferably 40 to 90% of the weight.

[0018] In this invention, a potassium titanate fiber and/or straw SUTONAITO are used as an inorganic fiber blended with the mixture of half-aromatic polyamide or this aromatic polyamide, and polyphenylene sulfide. As a potassium titanate fiber, there is especially no limit, and a well-known thing can be used widely conventionally, for example, 4 potassium titanate fibers, 6 potassium titanate fibers, 8 potassium titanate fibers, etc. can be used. Although especially a limit does not have the dimension of a potassium titanate fiber, it is [usually and 0.01–1 micrometer of diameters of average fiber] 3–30 micrometers preferably 0.1–0.5 micrometers and 1–50 micrometers of mean fiber length. In this invention, a commercial item can also be used, for example, TISUMO (a trade name, the product made from Otsuka Chemistry, 0.2–0.5 micrometers of diameters of average fiber, 5–30 micrometers of mean fiber length) etc. can be used. Straw SUTONAITO is an inorganic fiber which consists of a meta-calcium silicate. although especially a limit does not have the dimension of straw SUTONAITO, either — usually — 0.1–15 micrometers of diameters of average fiber — desirable — 2.0–7.0 micrometers and 3–180 micrometers of mean fiber length — desirable — 20–100 micrometers and three or more average aspect ratios — desirable — 3–50 — it is 5–30 more preferably. A commercial item can be suitably used also as straw SUTONAITO, for example, BAISUTARU K101 (a trade name, the product made from Otsuka Chemistry, micrometers [of diameters of average fiber / 2–5], 5–30 micrometers of mean fiber length), NyglosI-10013 (a trade name, the product made from Nyco, 5–30 micrometers of diameters of average fiber, 5–30 micrometers of mean fiber length), etc. can be used. When the rate of protection from light and white degree of a resin constituent which are obtained are taken into consideration also in these, a potassium titanate fiber is desirable.

[0019] In this invention, in order to raise further physical properties, such as a mechanical strength of the resin constituent obtained, surface treatment may be performed to a potassium titanate fiber and straw SUTONAITO. What is necessary is just to perform surface preparation using a silane coupling agent, a titanium coupling agent, etc. according to a well-known approach. Also in these, a silane coupling agent is desirable and especially an amino silane is desirable.

[0020] It is usually good to make [of the resin constituent whole quantity] more preferably the loadings of a potassium titanate fiber and/or straw SUTONAITO into 20 – 60 % of the weight (resinous principle: 40 – 80 % of the weight) five to 70% of the weight ten to 70% of the weight (resinous principle: 30 – 90 % of the weight). When it separates from 5 – 70% of the weight of the range, there is a possibility that the resin constituent which filled with the high level the various physical properties needed for a reflecting plate may not be obtained.

[0021] In this invention, it is the range which does not spoil the various desirable physical properties of a resin constituent, and in order to raise further the rate of a light reflex, protection-from-light nature, etc. especially, titanium oxide may be blended. When using straw SUTONAITO as an inorganic fiber especially, it is desirable to use titanium oxide together. Although two or more sorts of things from which it is not restricted especially as titanium oxide, but each thing of various crystalline forms, such as an anatase mold, a rutile mold, and a monoclinic system mold, can be used, and a crystalline form differs can also be used together, a rutile mold with sufficient light stability with a high refractive index is desirable. Moreover, there is especially no limit also about the configuration of titanium oxide, each thing of various configurations, such as the shape of a particle, fibrous, and tabular (the shape of the shape of a thin film integrated circuit and a scale and a mica etc. is included), can be used, and two or more sorts of things from which a configuration differs can also be used together. Although especially a limit does not have the dimension of titanium oxide, that whose mean particle diameter is about 0.1–0.3 micrometers is desirable. Moreover, what gave various finishing agents may be used. Although what is necessary is just to choose suitably in the range which especially the loadings of titanium oxide are not restricted, but its reflective effectiveness improves, and moreover does not spoil the desirable physical properties of a resin constituent. Usually, 1 – 40% of the weight of the resin constituent whole quantity (resinous principle: 30 to 94% of the weight) potassium titanate fiber and/or straw SUTONAITO: — 5 – 69-% of the weight extent — desirable — 5 – 30-% of the weight (resinous principle: 30 – 90-% of the weight, potassium titanate fiber, and/or straw SUTONAITO: 5–65 % of the weight) extent — then, it is good.

[0022] A potassium titanate fiber and well-known inorganic fibers other than straw SUTONAITO may be blended with the resin constituent of this invention in the range which does not spoil the desirable physical properties. It is not limited especially as this inorganic fiber, for example, zinc oxide fiber, titanate-acid sodium fiber, boric-acid aluminum fiber, boric-acid magnesium fiber, magnesium-oxide fiber, aluminum silicate fiber, silicon nitride fiber, etc. can be mentioned. An antioxidant, a thermostabilizer, etc. may be blended with the resin constituent of this invention in the range which does not spoil the desirable physical properties.

[0023] As an antioxidant, a phenolic antioxidant, the Lynn system antioxidant, a sulfur system antioxidant, etc. can be mentioned. As a phenolic antioxidant, for example A triethylene glycol screw [3-(3-t-butyl-5-methyl-4-hydroxyphenyl) propionate], A 1,6-hexanediol screw [3-(3, 5-G t-butyl-4-hydroxyphenyl) propionate], Pentaerythrityl-tetrakis [3-(3, 5-G t-butyl-4-hydroxyphenyl) propionate], Octadecyl-3-(3, 5-G t-butyl-4-hydroxyphenyl) propionate, 3 5-G t-butyl-4-hydroxybenzyl FOSUFONETO-diethyl ester, N and N'-hexa methylenebis (3 5 – G t-butyl-4-hydroxy-hydronalium thinner MAMIDO), 1, 3, 5-trimethyl -2, 4, 6-tris (3, 5-G t-butyl-4-hydroxybenzyl) benzene, 3 and 9-screw [2-{3-(3-t-butyl-4-hydroxy-5-methylphenyl) propionyloxy}-1 and 1-dimethyl ethyl]-tetraoxaspiro [2, 4, 8, and 10-] [5, 5] undecane etc. can be mentioned. Also in these, pentaerythrityl tetrakis [3-(3, 5-G t-butyl-4-hydroxyphenyl) propionate], N, and N'-hexa methylenebis (3 5 – G t-butyl-4-hydroxy-hydronalium thinner MAMIDO) is desirable. As an example of the Lynn system anti-oxidant, for example A tris (2, 4-G t-buthylphenyl) FOSU fight, 2-[[2, 4 and 8, 10-tetrakis (1 and 1-dimethyl ETERU) dibenzo [d, f] [— 1 and 3 — 2] dioxo FOSUFEBIN 6-IRU] oxy-]-N and N-screw [2-[[2, 4, 8, and 10-tetrakis (1, 1 dimethyl

ethyl) dibenzo [d, f] [1, 3, 2] dioxo FOSUFEBIN 6-IRU] oxy-]-ethyl] ethanamine, Screw (2, 6-G t-butyl-4-methylphenyl) pentaerythritoldiphosphite etc. can be mentioned. Also in these 2-[[2, 4 and 8, 10-tetrakis (1 and 1-dimethyl ETERU) dibenzo [d, f] [— 1 and 3 — 2] dioxo FOSUFEBIN 6-IRU] oxy-]-N and N-screw [2-[[2, 4, 8, and 10-tetrakis (1, 1 dimethyl ethyl) dibenzo [d, f] [1, 3, 2] dioxo FOSUFEBIN 6-IRU] oxy-]-ethyl] ethanamine is desirable. As an example of a sulfur system anti-oxidant, they are a 2 and 2-thio-diethylene screw [3-(3, 5-G t-butyl-4-hydroxyphenyl) propionate] and tetrakis, for example. [Methylene-3-(dodecyl thio) propionate] methane etc. can be mentioned. These antioxidants can use one sort independently, or can use two or more sorts together.

[0024] Furthermore, one sort of the various additives used for synthetic resin from the former or two sorts or more can be blended with the resin constituent of this invention in the range which does not spoil the desirable physical properties. As this additive, inorganic fillers, such as talc, a silica, and a zinc oxide (the thing of a tetrapod configuration is included), a flame retarder, a plasticizer, a nucleating additive, a color, a pigment, a release agent, an ultraviolet ray absorbent, etc. can be mentioned, for example.

[0025] The resin constituent of this invention can manufacture other additives by carrying out melting mixing according to a well-known approach with aromatic polyamide, straw SUTONAITO, and/or a potassium titanate fiber if needed further. Each well-known melting mixing equipment, such as a twin screw extruder, can use it for melting mixing. The resin constituent of this invention can be fabricated to various reflecting plates by the well-known resin fabricating methods, such as an injection-molding method, compression forming, and an extrusion method.

[0026] The reflecting plate obtained in this way can be suitably used as reflecting plates for luminescence equipments, such as luminescence equipment used for outdoor displays, such as optical-communication equipments, such as various kinds of electric electronic parts, the keyless entry system of an automobile, the lighting in a refrigerator warehouse, the back light of a liquid crystal display, an automobile front panel lighting system, a lighting stand, a bed light, home-electronics indicators, and an infrared communication device, a head-lining lighting system, and a traffic sign, etc.

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EXAMPLE

[Example] An example and the example of a comparison are given to below, and this invention is concretely explained to it. In addition, the synthetic resin and the inorganic fiber which were used in the example of this example comparison are specifically as follows.

[Synthetic resin]

Half-aromatic-polyamide A: Half-aromatic polyamide to which it comes to carry out the polymerization of a hexamethylenediamine, a terephthalic acid, and the adipic acid at 50-mol % and 32-mol % of a rate, respectively (a trade name "AMODERU A4000", Du Pont make) [% and 18 mol]

Half-Aromatic-polyamide B: Half-aromatic polyamide which comes to carry out the polymerization of 2-methyl pentamethylene diamine, a hexamethylenediamine, and the terephthalic acid at 25-mol % and 25-mol % of a rate, respectively (a trade name "Zytel HTN501", the Du Pont make, melting point of 305 degrees C, glass transition temperature of 125 degrees C) [% and 50 mol]

Polyphenylene sulfide : (it is called "PPS" a trade name "Ryton M2888", the Toray Industries, Inc. make, and the following)

Aromatic polyester : (it is called "LCP" the product made from trade name "Vectra C950" Polyp Lastic, and the following)

[0028] [Inorganic fiber]

Straw SUTONAITO : (the product made from trade name "BAISUTARU K101" Otsuka Chemistry, 2-5 micrometers of diameters of average fiber, 20-30 micrometers of mean fiber length)

Potassium titanate fiber : (the product made from trade name "TISUMO D101" Otsuka Chemistry, fiber length of 10-20 micrometers, 0.3-0.6 micrometers of diameters of fiber)

Powdered titanium oxide : (a trade name "JR-405", the TAYCA CORP. make, mean particle diameter of 0.21 micrometers)

Chopped glass fiber : (it is called "GF" the product made from "ECS 03T 294-/Trade name PL" NEC Glass, and the following.)

[0029] the potassium titanate fiber or straw SUTONAITO from the side feeder after supplying half-aromatic polyamide or half-aromatic polyamide, and PPS to the Maine hopper of a 2 shaft kneading extruder by the blending ratio of coal (% of the weight) shown in examples 1-8 and the example 1 of a comparison - the 4 following table 1 and carrying out melting kneading at 330 degrees C — titanium oxide was added further, melting kneading was carried out, it extruded, and the pellet of the resin constituent of this invention was manufactured.

[0030]

[Table 1]

	実 施 例								比 較 例					
	1	2	3	4	5	6	7	8	1	2	3	4	5	6
半芳香族ポリアミドA	50	50	50	35	—	—	—	—	50	35	—	—	—	—
半芳香族ポリアミドB	—	—	—	—	50	50	50	35	—	15	50	35	—	—
PPS	—	—	—	15	—	—	—	15	—	—	—	15	50	—
LCP	—	—	—	—	—	—	—	—	—	—	—	—	—	50
チタン酸カリウム繊維	50	30	—	—	50	30	—	—	—	—	—	—	—	—
フラストナイト	—	—	30	30	—	—	30	30	—	—	—	—	30	30
GF	—	—	—	—	—	—	—	—	30	30	30	30	—	—
酸化チタン	—	20	20	20	—	20	20	20	20	20	20	20	20	20
引張強さ(MPa)	183	178	138	117	191	171	130	116	132	119	130	121	131	91
引張伸び(%)	2.5	2.7	2.4	2.1	2.4	2.6	2.1	1.8	2.4	2	2.2	1.8	2.1	1.4
曲げ強さ(MPa)	339	257	217	161	331	278	238	166	195	149	200	155	174	141
曲げ弾性率(GPa)	15.3	12.0	10.7	11.0	16.5	13.1	11.5	12.7	10.3	10.1	11	10.7	14.5	14.3
IZOD衝撃値(J/m)	49	45	39	35	42	48	39	34	47	40	45	39	37	20
HDT(°C)	285	281	280	270	250	245	245	242	285	275	260	248	232	223
線膨張係数($\times 10^{-5}/^{\circ}\text{C}$) MD	1.5	2.3	2.5	2.4	1.1	1.8	2.0	1.9	2.1	2.0	1.5	1.8	1.9	2.1
TD	5.0	4.7	4.6	4.6	3.5	3.3	3.2	3.2	5.7	5.7	4.0	4.1	3.2	3.0
TD/MD	3.3	2.0	1.8	1.9	3.2	1.8	1.6	1.7	2.7	2.9	2.7	2.6	1.7	1.4
Q値($\times 10^{-2}\text{cm}^3$)	2.4	1.2	1.1	4.9	9.6	8.2	8.1	14	0.5	2.9	5.5	9.2	15.3	3.2
吸水率 (%)	0.2	0.2	0.19	0.14	0.1	0.1	0.09	0.07	0.21	0.15	0.16	0.1	0.02	0.03
ハンター白度	○	○	○	○	○	○	○	○	△	△	○	○	××	××
耐熱変色試験後	△	△	○	△	○	○	○	○	×	×	○	○	××	××
光線透過率(460nm)(%)	○	○	○	○	○	○	○	○	△	△	△	△	○	○
(530nm)(%)	○	○	○	○	○	○	○	○	×	×	×	×	○	○
(630nm)(%)	○	○	○	○	○	○	○	○	×	×	×	×	○	○

[0031] the pellet of the resin constituent of this invention obtained above — JIS test piece production — public funds — it supplied to the injection molding machine (a trade name "JS75", Japan Steel Works Make, 330 degrees C of cylinder temperatures) equipped with a mold (die temperature of 130 degrees C), injection molding was carried out to it, various JIS test pieces were manufactured, and the following performance tests were presented.

(1) Tensile strength and **** elongation after fracture : JIS It measured according to K7113.

(2) Bending strength and a bending elastic modulus : JIS It measured according to K7271.

(3) The Izod (IZOD) impact resistance value with a notch : JIS According to K7110, it evaluated with the No. 1 test piece.

(4) HDT(heat resistance test):JIS According to K7207, the load deflection temperature (HDT, **) when adding bending stress 1.82MPa was measured.

(5) Coefficient of linear expansion : TAM120 apparatus for thermomechanical analysis (a trade name "SSC5200H disk TESHON", Seiko Instruments make) was used, and the coefficient of linear expansion of 20–130 degrees C was measured. The direction of taking over was set to MD, and the direction of a right angle was set to TD. in order to consider as the index of an anisotropy — the ratio of the coefficient of linear expansion of MD and TD — TD/MD was indicated.

(6) flow rate (Q value): — a quantity-ized type flow tester — using it — examples 1–8 and the examples 1–4 of a comparison — 330x9.8MPa — moreover, in 310x9.8MPa, the example 9 of a comparison made remaining-heat time amount 360 seconds, respectively, and measured 290 degree-Cx9.8MPa and the example 10 of a comparison by 10mm in 1mm of orris apertures, and thickness.

(7) Water absorption : JIS It measured according to K7209.

(8) Brightness by Hunter : it measured using the color difference meter by Nippon Denshoku Co., Ltd. moreover, evaluation — for O and 89 or more [less than 91], ** and 85 or more [less than 89] were indicated to be x, and 85 or less were indicated [93 or more white degree / O and 91 or more / less than 93] to be xx.

(9) Heat-resistant discoloration trial : the oven in 180 degree-Cx 2-hour air performed the heat-resistant discoloration trial, and white degree was measured like (8).

(10) Light transmission : the sample made into the shape of a film of 100-micrometer thickness with the vacuum press machine was measured according to U-recording spectrophotometer by Hitachi, Ltd. 3000 form, and the permeability of 460nm, 530nm, and 630nm was indicated. Evaluation indicated O and 3% or more to be **s less than 5%, and O and 0% or more were indicated to be x for 0% of permeability 5% or more less than 3%. These results are shown in Table 1.

[0032] From the result of Table 1, the resin constituent of this invention sets to a mechanical strength, thermal resistance, coefficient of linear expansion (dimensional stability), a fluidity (fabrication nature), white degree, thermochromism, and light transmission. The physical properties demanded as a reflecting plate are filled with a high level, especially light transmission falls greatly compared with the examples 1–4 of a comparison which used glass fiber, and is remarkably inferior in white degree further for the own amorous glance of base resin in the examples 5 and 6 of a comparison using other heat resistant resin, such as PPS and LCP, and it is in ** that the direction of a constituent given in this example is excellent.

[Translation done.]

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(54)【発明の名称】 反射板用樹脂組成物

(57)【要約】

【課題】 所望される各種物性を高水準に満たし、反射板として好適に使用できる反射板用材料を提供する。

【解決手段】 本発明は、全モノマー成分中の芳香族モノマーの割合が20モル%以上である半芳香族ポリアミド30～95重量%とチタン酸カリウム繊維及び／又はワラストナイト5～70重量%とを含有することを特徴とする反射板用樹脂組成物に係る。

【特許請求の範囲】

【請求項 1】 全モノマー成分中の芳香族モノマーの割合が 20 モル%以上である半芳香族ポリアミド 30～95 重量%とチタン酸カリウム繊維及び／又はワラストナイト 5～70 重量%とを含有することを特徴とする反射板用樹脂組成物。

【請求項 2】 前記半芳香族ポリアミドが、モノマー成分として芳香族ジカルボン酸及び脂肪族アルキレンジアミンを含む半芳香族ポリアミドである請求項 1 記載の反射板用樹脂組成物

【請求項 3】 前記半芳香族ポリアミドが、更にモノマー成分として脂肪族ジカルボン酸を含む半芳香族ポリアミドである請求項 2 に記載の反射板用樹脂組成物。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、発光ダイオード素子 (Light Emission Diode、以下「LED」という) 等の発光装置用反射板 (リフレクター) 材料として好適に使用できる反射板用樹脂組成物に関する。

【0002】

【従来の技術及び発明が解決しようとする課題】近年、LED 性能の向上により発光色の多様化と高輝度発光が可能となったことから、そのエネルギー消費量や発熱量の小さなことを生かした各種の発光装置への採用が広がっている。こうした用途拡大の一つとしては、従来の電球代替用途が挙げられる。かかる発光装置は、通常、合成樹脂を成形してなる反射板にダイオードを挿入、接着もしくは添付し、エポキシ樹脂等の封止材料で封止することにより製造されている。このような発光装置に使用される LED 反射板は、LED の性能を左右する重要な部品であるため、その材料についても種々の検討がなされている。LED 反射板用材料には、まず、高い光反射率と遮光率が要求される。また、LED 反射板は 1～2 mm 程度の非常に微細な且つ複雑精緻な形状の成形品とされることも多いことから、その材料には、射出成形等により所望の形状を精確に再現し得るような良好な成形加工性が必要とされる。更に、LED 反射板は非常に微細且つ複雑精緻であるのみならず、僅かな変形でもその光反射率を低下させる虞があるため、その材料は、機械的強度や寸法安定性に優れたものでなければならない。加えて、エポキシ樹脂による封止や回路基板等へのハンダ付け等、高温に晒される機会もあるため、高い耐熱性も要求される。このように、LED 反射板は、上記の如き種々の物性が要求されるものであるが、これらの物性は、LED 以外の発光装置用反射板においても、所望されるものである。

【0003】これに対し、反射板用材料として、例えば、芳香族ポリエステルや芳香族ポリアミド等の溶融加工性ポリエステルにガラス繊維を配合し、更に

必要に応じて酸化チタンを配合してなる樹脂組成物が提案されている (特公平 6-38520 号公報)。この樹脂組成物は耐熱性や寸法安定性はある程度良好であるが、白度が充分ではなく、光反射率が低いという欠点がある。該公報には、ガラス繊維以外の配合可能な無機繊維として、チタン酸カリウム繊維やワラストナイトも挙げられているが、たとえこれらの無機繊維を用いたとしても、溶融加工性ポリエステルとの組み合わせでは、充分な光反射率を得ることはできない。

10 【0004】また、芳香族ポリエステル 10～40 重量%、ポリアミド 15～55 重量%、ポリカーボネート 15～45 重量%及び酸化チタン 10～30 重量%を含む樹脂組成物 (特開昭 59-113049 号公報)、ポリアミド (ナイロン 46) 60～95 重量%と酸化チタン 5～40 重量%とからなる樹脂組成物 (特開平 2-288274 号公報)、ポリエステルとポリアミドとからなるマトリックス樹脂に、酸化チタン 10～50 重量%及び変性ポリオレフィン 0.3～30 重量%を配合した樹脂組成物 (特開平 3-84060 号公報) 等も提案されている。しかし、これらの樹脂組成物は、成形収縮率や線膨張率が大きく、特に高温負荷時の線膨張率が大きい

20 ため寸法安定性が悪いという欠点がある。更に、光反射率や遮光率においても十分満足できるものではない。即ち、従来の反射板用材料は、反射板として所望される一部の物性については満足できる水準であるものの、他の物性においては満足できるものではないという問題点を有している。

【0005】そこで、本発明は、上記従来の問題点に鑑み、所望される各種物性を高水準に満たし、反射板として好適に使用できる反射板用材料を提供することを課題とする。

【0006】

【課題を解決するための手段】本発明者は、上記課題を解決すべく鋭意研究を重ねた結果、反射板用材料に適した樹脂組成物を得ることに成功し、本発明を完成した。即ち、本発明は、全モノマー成分中の芳香族モノマーの割合が 20 モル%以上である半芳香族ポリアミド 30～95 重量%とチタン酸カリウム繊維及び／又はワラストナイト 5～70 重量%とを含有することを特徴とする反

30 射板用樹脂組成物に係る。

【0007】本発明によれば、上記半芳香族ポリアミドに、特定の無機繊維を配合することにより、該半芳香族ポリアミドが持つ有用な物性を損なうことなく、光反射率、白度、成形加工性、機械的強度、寸法安定性、耐熱性、吸湿性において所望される物性を高水準で満たし、特に、遮光性に優れ、高温に晒されても変色を起こすことなく高い白度を維持し得る樹脂組成物が提供される。合成樹脂に無機繊維を配合すると、機械的強度、寸法安定性、耐熱性等が向上することは知られているが、本発明は、これらの効果を奏すると共に、更に、上記半芳香

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族ポリアミドとチタン酸カリウム繊維、ワラストナイトとの組み合わせにより、特に、遮光性が顕著に高いという優れた効果を奏する。上記の様な優れた物性を有する本発明の樹脂組成物は、反射板材料、特にLED反射板用材料として有用である。

【0008】

【発明の実施の形態】本発明において、半芳香族ポリアミドとは、ポリアミドのモノマー成分として、芳香族モノマーを含有するポリアミドを意味するものである。本発明において、マトリックスとして使用する半芳香族ポリアミドは、ポリアミドを構成するモノマー成分中の芳香族モノマーが20モル%以上、好ましくは25モル%以上、より好ましくは30～60モル%であり、融点が好ましくは280℃以上、より好ましくは280～320℃である半芳香族ポリアミドである。ここで、芳香族ポリアミドにおけるモノマーのモル分率は、重合原料におけるモノマーの割合を所定のモル分率とすることにより調整することができる。

【0009】芳香族モノマーとしては、例えば、芳香族ジアミン、芳香族ジカルボン酸、芳香族アミノカルボン酸等を挙げられる。芳香族ジアミンとしては、例えば、p-フェニレンジアミン、o-フェニレンジアミン、m-フェニレンジアミン、パラキシレンジアミン、メタキシレンジアミン等が、芳香族ジカルボン酸としては、例えば、テレフタル酸、イソフタル酸、フタル酸、2-メチルテレフタル酸、ナフタレンジカルボン酸等が、また芳香族アミノカルボン酸としては、例えば、p-アミノ安息香酸等が挙げられる。これらの中でも、芳香族ジカルボン酸が好ましい。芳香族モノマーは1種を単独で使用でき又は2種以上を併用できる。芳香族モノマー以外のモノマー成分としては、脂肪族ジカルボン酸、脂肪族アルキレンジアミン、脂環式アルキレンジアミン、脂肪族アミノカルボン酸等を挙げられる。

【0010】脂肪族ジカルボン酸としては、アジピン酸、セバシン酸、アゼライン酸、ドデカン二酸等を挙げられる。これらの中でも、アジピン酸が好ましい。脂肪族ジカルボン酸は1種を単独で使用でき又は2種以上を併用できる。脂肪族アルキレンジアミンは、直鎖状であっても分岐鎖状であってもよい。具体的には、エチレンジアミン、トリメチレンジアミン、テトラメチレンジアミン、ペンタメチレンジアミン、ヘキサメチレンジアミン、1, 7-ジアミノヘプタン、1, 8-ジアミノオクタン、1, 9-ジアミノノナン、1, 10-ジアミノデカン、2-メチルペンタメチレンジアミン、2-エチルテトラメチレンジアミン等を挙げられる。これらの中でも、ヘキサメチレンジアミン、2-メチルペンタメチレンジアミン等が好ましい。脂肪族アルキレンジアミンは1種を単独で使用でき又は2種以上を併用できる。

【0011】脂環式アルキレンジアミンとしては、例えば、1, 3-ジアミノシクロヘキサン、1, 4-ジアミ

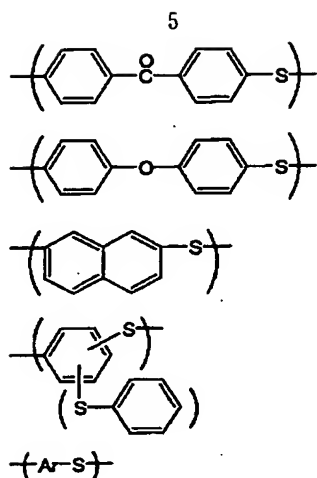
ノシクロヘキサン、1, 3-ビス(アミノメチル)シクロヘキサン、ビス(アミノメチル)シクロヘキサン、ビス(4-アミノシクロヘキシル)メタン、4, 4'-ジアミノ-3, 3'-ジメチルジシクロヘキシルメタン、イソフォロンジアミン、ピペラジン等を挙げられる。脂環式アルキレンジアミンは1種を単独で使用でき又は2種以上を併用できる。

【0012】脂肪族アミノカルボン酸としては、例えば、6-アミノカプロン酸、11-アミノウンデカン酸、12-アミノドデカン酸等を挙げることができ、これらに対応する環状のラクタムを用いてもよい。脂肪族アミノカルボン酸は1種を単独で使用でき又は2種以上を併用できる。これらのモノマー成分の中でも、脂肪族ジカルボン酸、脂肪族アルキレンジアミン等が好ましい。これらのモノマー成分は1種を単独で使用でき又は2種以上併用できる。

【0013】上記の半芳香族ポリアミドの中でも、芳香族ジカルボン酸と脂肪族アルキレンジアミンとを含むもの、芳香族ジカルボン酸と脂肪族ジカルボン酸と脂肪族アルキレンジアミンとを含むもの等が好ましい。これらの半芳香族ポリアミドの中でも、ジカルボン酸がテレフタル酸、テレフタル酸とイソフタル酸との混合物、又は、テレフタル酸とイソフタル酸とアジピン酸との混合物であるものが好ましい。前記2種の混合物においては、テレフタル酸の割合が40モル%以上のものが特に好ましい。更に、これらの半芳香族ポリアミドの中でも、脂肪族アルキレンジアミンが、ヘキサメチレンジアミン又はヘキサメチレンジアミンと2-メチルペンタメチレンジアミンとの混合物であるものが特に好ましい。半芳香族ポリアミドの中で、特に好ましいものの一例として、テレフタル酸50モル%、ヘキサメチレンジアミン25モル%及び2-メチルペンタメチレンジアミン25モル%を共重合したものを挙げることができる。半芳香族ポリアミドを構成する芳香族モノマーや他のモノマー成分の構成比や種類を適宜選択することにより、融点、ガラス転移温度等を適宜調整することができる。

【0014】本発明においては、樹脂組成物のマトリックス樹脂として、半芳香族ポリアミドと共に、ポリフェニレンサルファイドを使用してもよい。ポリフェニレンサルファイドとしては公知のものをいずれも使用でき、また、線状構造、架橋構造等のいずれの構造であってもよい。例えば、以下の一般式で示される繰り返し単位を構成要素として含有する結晶性高分子を挙げられる。

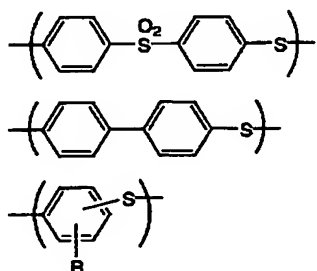
【化1】



〔式中、Arは、1, 4-フェニレン基、1, 3-フェニレン基又は1, 2-フェニレン基を示す。〕

【0015】本発明においては、上記繰り返し単位を主成分とするもの、すなわち上記繰り返し単位のみからなるもの、又はこれを好ましくは80モル%以上、より好ましくは90モル%含むものが望ましい。ポリフェニレンサルファイドの実質的な全量が、上記繰り返し単位から成り立っていない場合、残りは共重合可能な、例えば下記のような繰り返し単位からなる成分で充足させることができる。

〔化2〕



〔式中、Rはアルキル基、アルコキシ基、ニトロ基又はフェニレン基を示す。〕

【0016】本発明においては、ポリフェニレンサルファイドとして、市販品を使用してもよい。市販品としては、例えば、トープレン（商品名、トープレン（株）製）、ライトン（商品名、東レ（株）製）、フォートロン（商品名、ポリプラスチックス（株）製）等を挙げられる。

【0017】本発明においては、マトリックス樹脂成分の配合量は、該樹脂成分が半芳香族ポリアミド単独の場合及び半芳香族ポリアミドとポリフェニレンサルファイドとの併用の場合を含め、樹脂組成物全量の30～95重量%、好ましくは30～90重量%、より好ましくは40～70重量%とする。樹脂成分の配合量が30～95重量%の範囲から外れると、反射板に必要とされる各種物性を高水準で満たした樹脂組成物が得られない虞がある。尚、半芳香族ポリアミドとポリフェニレンサルファイドとを併用する場合におけるこれらの樹脂の配合割

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合は適宜選択できるが、半芳香族ポリアミドが、好ましくは、これらの樹脂の合計量の40～90重量%、より好ましくは50～80重量%含まれるように配合すればよい。

【0018】本発明においては、半芳香族ポリアミド又は該芳香族ポリアミドとポリフェニレンサルファイドとの混合物に配合する無機繊維として、チタン酸カリウム繊維及び／又はワラストナイトを使用する。チタン酸カリウム繊維としては特に制限はなく、従来公知のものを広く使用でき、例えば、4チタン酸カリウム繊維、6チタン酸カリウム繊維、8チタン酸カリウム繊維等を使用することができる。チタン酸カリウム繊維の寸法は特に制限はないが、通常、平均繊維径0.01～1μm、好ましくは0.1～0.5μm、平均繊維長1～50μm、好ましくは3～30μmである。本発明では市販品も使用でき、例えば、ティスモ（商品名、大塚化学（株）製、平均繊維径0.2～0.5μm、平均繊維長5～30μm）等を使用することができる。ワラストナイトは、メタケイ酸カルシウムからなる無機繊維である。ワラストナイトの寸法も特に制限はないが、通常、平均繊維径0.1～15μm、好ましくは2.0～7.0μm、平均繊維長3～180μm、好ましくは20～100μm、平均アスペクト比3以上、好ましくは3～50、より好ましくは5～30である。ワラストナイトとしても市販品を好適に使用でき、例えば、バイスタルK101（商品名、大塚化学（株）製、平均繊維径2～5μm、平均繊維長5～30μm）、Nyglos1-10013（商品名、Nycos社製、平均繊維径5～30μm、平均繊維長5～30μm）等を使用することができる。これらの中でも、得られる樹脂組成物の遮光率と白度を勘案すると、チタン酸カリウム繊維が好ましい。

【0019】本発明においては、得られる樹脂組成物の機械的強度等の物性をより一層向上させるために、チタン酸カリウム繊維及びワラストナイトに表面処理を施してもよい。表面処理は公知の方法に従い、シランカップリング剤、チタンカップリング剤等を用いて行えばよい。これらの中でも、シランカップリング剤が好ましく、アミノシランが特に好ましい。

【0020】チタン酸カリウム繊維及び／又はワラストナイトの配合量は、通常、樹脂組成物全量の5～70重量%、好ましくは10～70重量%（樹脂成分：30～90重量%）、より好ましくは、20～60重量%（樹脂成分：40～80重量%）とするのがよい。5～70重量%の範囲から外れると、反射板に必要とされる各種物性を高水準で満たした樹脂組成物が得られない虞がある。

【0021】本発明では、樹脂組成物の好ましい各種物性を損なわない範囲で、特にその光反射率や遮光性等を更に向上させるために、酸化チタンを配合してもよい。特に、無機繊維としてワラストナイトを用いる場合に

は、酸化チタンを併用するのが好ましい。酸化チタンとしては特に制限されず、アナターゼ型、ルチル型、単斜晶型等の各種結晶形態のものをいずれも使用でき、結晶形態の異なるものを2種以上併用することもできるが、屈折率が高く光安定性の良いルチル型が好ましい。また、酸化チタンの形状についても特に制限はなく、粒子状、繊維状、板状（薄片状、鱗片状、雲母状等を含む）等の各種形状のものをいずれも使用でき、形状の異なるものを2種以上併用することもできる。酸化チタンの寸法は特に制限はないが、平均粒径が0.1~0.3 μm 程度のものが好ましい。また各種表面処理剤を施したものをを用いても良い。酸化チタンの配合量は特に制限されず、反射効率が向上し、しかも樹脂組成物の好ましい物性を損なわない範囲の中で適宜選択すればよいが、通常、樹脂組成物全量の1~40重量%（樹脂成分：30~94重量%、チタン酸カリウム繊維及び／又はワラストナイト：5~69重量%）程度、好ましくは5~30重量%（樹脂成分：30~90重量%、チタン酸カリウム繊維及び／又はワラストナイト：5~65重量%）程度とすればよい。

【0022】本発明の樹脂組成物には、その好ましい物性を損なわない範囲で、チタン酸カリウム繊維及びワラストナイト以外の公知の無機繊維を配合してもよい。該無機繊維としては特に限定されず、例えば、酸化亜鉛繊維、チタン酸ナトリウム繊維、ホウ酸アルミニウム繊維、ホウ酸マグネシウム繊維、酸化マグネシウム繊維、珪酸アルミニウム繊維、窒化珪素繊維等を挙げることができる。本発明の樹脂組成物には、その好ましい物性を損なわない範囲で、酸化防止剤、熱安定剤等を配合してもよい。

【0023】酸化防止剤としては、フェノール系酸化防止剤、リン系酸化防止剤、イオウ系酸化防止剤等を挙げられる。フェノール系酸化防止剤としては、例えば、トリエチレングリコール・ビス〔3-（3-*t*-ブチル-5-メチル-4-ヒドロキシフェニル）プロピオネート〕、1,6-ヘキサジオール・ビス〔3-（3,5-ジ-*t*-ブチル-4-ヒドロキシフェニル）プロピオネート〕、ペンタエリスリチル-テトラキス〔3-（3,5-ジ-*t*-ブチル-4-ヒドロキシフェニル）プロピオネート〕、オクタデシル-3-（3,5-ジ-*t*-ブチル-4-ヒドロキシフェニル）プロピオネート、3,5-ジ-*t*-ブチル-4-ヒドロキシベンジルフォスフォネート-ジエチルエステル、N,N'-ヘキサメチレンビス（3,5-ジ-*t*-ブチル-4-ヒドロキシ-ヒドロシナミド）、1,3,5-トリメチル-2,4,6-トリス（3,5-ジ-*t*-ブチル-4-ヒドロキシベンジル）ベンゼン、3,9-ビス〔2-〔3-（3-*t*-ブチル-4-ヒドロキシ-5-メチルフェニル）プロピオニルオキシ〕-1,1-ジメチルエチル〕-2,4,8,10-テトラオキサスピロ〔5,50

5〕ウンデカン等を挙げられる。これらの中でも、ペンタエリスリチル・テトラキス〔3-（3,5-ジ-*t*-ブチル-4-ヒドロキシフェニル）プロピオネート〕、N,N'-ヘキサメチレンビス（3,5-ジ-*t*-ブチル-4-ヒドロキシ-ヒドロシナミド）が好ましい。リン系酸化防止剤の具体例としては、例えば、トリス（2,4-ジ-*t*-ブチルフェニル）フォスファイト、2-〔〔2,4,8,10-テトラキス（1,1-ジメチルエチル）ジベンゾ〔d,f〕〔1,3,2〕ジオキサフォスフェビン6-イル〕オキシ〕-N,N-ビス〔2-〔〔2,4,8,10-テトラキス（1,1-ジメチルエチル）ジベンゾ〔d,f〕〔1,3,2〕ジオキサフォスフェビン6-イル〕オキシ〕-エチル〕エタナミン、ビス（2,6-ジ-*t*-ブチル-4-メチルフェニル）ペンタエリスリチルジホスファイトなどを挙げられる。これらの中でも、2-〔〔2,4,8,10-テトラキス（1,1-ジメチルエチル）ジベンゾ〔d,f〕〔1,3,2〕ジオキサフォスフェビン6-イル〕オキシ〕-N,N-ビス〔2-〔〔2,4,8,10-テトラキス（1,1-ジメチルエチル）ジベンゾ〔d,f〕〔1,3,2〕ジオキサフォスフェビン6-イル〕オキシ〕-エチル〕エタナミンが好ましい。イオウ系酸化防止剤の具体例としては、例えば、2,2-チオ-ジエチレンビス〔3-（3,5-ジ-*t*-ブチル-4-ヒドロキシフェニル）プロピオネート〕、テトラキス〔メチレン-3-（ドデシルチオ）プロピオネート〕メタン等を挙げられる。これらの酸化防止剤は1種を単独で使用でき又は2種以上を併用できる。

【0024】更に本発明の樹脂組成物には、その好ましい物性を損なわない範囲で、従来から合成樹脂用に用いられている各種添加剤の1種又は2種以上を配合することができる。該添加剤としては、例えば、タルク、シリカ、酸化亜鉛（テトラポット形状のものを含む）等の無機充填材、難燃剤、可塑剤、核剤、染料、顔料、離型剤、紫外線吸収剤等を挙げられる。

【0025】本発明の樹脂組成物は、芳香族ポリアミドとワラストナイト及び／又はチタン酸カリウム繊維と、更に必要に応じて、他の添加剤とを公知の方法に従って熔融混合することによって製造できる。熔融混合には、二軸スクリュウ押出機等の公知の熔融混合装置がいずれも使用できる。本発明の樹脂組成物は、射出成形法、圧縮成形法、押出成形法等の公知の樹脂成形法により、各種反射板に成形することができる。

【0026】かくして得られた反射板は、例えば、各種の電気電子部品、自動車のキーレスエントリーシステム、冷蔵庫庫内照明、液晶表示装置のバックライト、自動車フロントパネル照明装置、照明スタンド、ベッドライト、家電製品インジケータ類、赤外線通信装置等の光通信機器類、天井照明装置、交通標識等の屋外表示装置等に用いられる発光装置等の発光装置用反射板として

好適に使用できる。

【0027】

【実施例】以下に実施例及び比較例を挙げて本発明を具体的に説明する。なお、本実施例比較例で使用した合成樹脂及び無機繊維は、具体的には次の通りである。

【合成樹脂】

半芳香族ポリアミドA：ヘキサメチレンジアミン、テレフタル酸、アジピン酸をそれぞれ50モル%、32モル%、18モル%の割合で重合させてなる半芳香族ポリアミド（商品名「アモデルA4000」、デュボン社製）

半芳香族ポリアミドB：2-メチルペンタメチレンジアミン、ヘキサメチレンジアミン及びテレフタル酸をそれぞれ25モル%、25モル%及び50モル%の割合で重合してなる半芳香族ポリアミド（商品名「ザイテルHTN501」、デュボン社製、融点305℃、ガラス転移温度125℃）

ポリフェニレンサルファイド：（商品名「ライトンM2888」、東レ（株）製、以下「PPS」という）

芳香族ポリエステル：（商品名「ベクトラC950」、ポリプラスチック（株）製、以下「LCP」という）

【0028】【無機繊維】

ワラストナイト：（商品名「バイスタルK101」、大塚化学（株）製、平均繊維径2～5μm、平均繊維長20～30μm）

チタン酸カリウム繊維：（商品名「ティスモD101」、大塚化学（株）製、繊維径10～20μm、繊維径0.3～0.6μm）

粉末状酸化チタン：（商品名「JR-405」、テイカ（株）製、平均粒径0.21μm）

チョップドガラスファイバー：（商品名「ECS 03T 294/PL」、日本電気ガラス（株）製、以下「GF」という。）

【0029】実施例1～8及び比較例1～4

下記表1に示す配合割合（重量%）で、半芳香族ポリアミド又は半芳香族ポリアミドとPPSとを二軸混練押出機のメインホッパーに投入し、330℃で熔融混練した後、サイドフィーダーから、チタン酸カリウム繊維又はワラストナイト、更には酸化チタンを加え、熔融混練して押出し、本発明の樹脂組成物のペレットを製造した。

【0030】

【表1】

	実 施 例								比 較 例							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6		
半芳香族ポリアミドA	50	50	50	35	—	—	—	—	50	35	—	—	—	—		
半芳香族ポリアミドB	—	—	—	—	50	50	50	35	—	15	50	35	—	—		
PPS	—	—	—	15	—	—	—	15	—	—	—	15	50	—		
LCP	—	—	—	—	—	—	—	—	—	—	—	—	—	50		
チタン酸カリウム繊維	50	30	—	—	50	30	—	—	—	—	—	—	—	—		
ワラストナイト	—	—	30	30	—	—	30	30	—	—	—	—	30	30		
GF	—	—	—	—	—	—	—	—	30	30	30	30	—	—		
酸化チタン	—	20	20	20	—	20	20	20	20	20	20	20	20	20		
引張強さ(MPa)	183	178	138	117	191	171	130	116	132	119	130	121	131	91		
引張破断伸び(%)	2.5	2.7	2.4	2.1	2.4	2.6	2.1	1.8	2.4	2	2.2	1.8	2.1	1.4		
曲げ強さ(MPa)	339	257	217	181	331	278	238	188	195	149	200	155	174	141		
曲げ弾性率(GPa)	15.3	12.0	10.7	11.0	16.5	13.1	11.5	12.7	10.3	10.1	11	10.7	14.5	14.3		
IZOD衝撃値(J/m)	49	45	39	35	42	48	39	34	47	40	45	39	37	20		
HDT(℃)	285	281	280	270	250	245	245	242	285	275	250	248	232	223		
線膨張係数(×10 ⁻⁵ /°C)	MD		1.5	2.3	2.5	2.4	1.1	1.8	2.0	1.9	2.1	2.0	1.5	1.8	1.9	2.1
	TD		5.0	4.7	4.6	4.6	3.5	3.3	3.2	3.2	5.7	5.7	4.0	4.1	3.2	3.0
	TD/MD		3.3	2.0	1.8	1.9	3.2	1.8	1.6	1.7	2.7	2.9	2.7	2.6	1.7	1.4
Q値(×10 ⁻² cm ³)	2.4	1.2	1.1	4.9	9.6	8.2	8.1	14	0.5	2.9	5.5	9.2	15.3	3.2		
吸水率(%)	0.2	0.2	0.19	0.14	0.1	0.1	0.09	0.07	0.21	0.15	0.15	0.1	0.02	0.03		
ハンター白度	成形後		○	○	○	○	○	○	△	△	○	○	×	×	×	×
	耐熱変色試験後		△	△	○	△	○	○	×	×	○	○	×	×	×	×
光線透過率(460nm)(%)			○	○	○	○	○	○	△	△	△	△	○	○		
	(530nm)(%)		○	○	○	○	○	○	×	×	×	×	×	○		
	(630nm)(%)		○	○	○	○	○	○	×	×	×	×	×	○		

【0031】上記で得られた本発明の樹脂組成物のペレットを、JIS試験片作製用金型（金型温度130℃）を装着した射出成形機（商品名「JIS75」、（株）日本製鋼所製、シリンダー温度330℃）に投入して射出成形し、各種JIS試験片を製造し、以下の性能試験に供した。

（1）引張強さ及び引張破断伸び：JIS K7113に準じて測定した。

（2）曲げ強さ及び曲げ弾性率：JIS K7271に準じて測定した。

（3）ノッチ付きアイゾット（IZOD）衝撃値：JIS K7110に準じ、1号試験片で評価した。

（4）HDT（耐熱性試験）：JIS K7207に準じて、曲げ応力1.82MPaを加えた時の荷重たわみ温度（HDT、℃）を測定した。

（5）線膨張係数：TAM120熱機械分析装置（商品名「SSC5200Hディスクーション」、セイコーインスツルメンツ（株）製）を使用し、20～130℃の線膨張係数を測定した。引き取り方向をMD、その直角方向をTDとした。異方性の指標とするためMDとTDの線膨張係数の比TD/MDを記載した。

（6）フローレート（Q値）：高化式フローテスターを使用し、実施例1～8、比較例1～4は330×9.8MPaにて、また比較例9は290℃×9.8MPa、また

比較例10は310×9.8MPaにて、それぞれ余熱時間を360秒とし、オリス孔径1mm、厚さ10mmにて測定した。

(7) 吸水率: JIS K7209に準じて測定した。

(8) ハンター白色度: 日本電色(株)製の色差計を用いて測定した。また評価は白度93以上を◎、93未満91以上を○、91未満89以上を△、89未満85以上を×、85以下を××と記載した。

(9) 耐熱変色試験: 耐熱変色試験は180℃×2時間 10
空气中オープンにて行い、(8)と同様に白度を測定した。

(10) 光線透過率: 真空プレス機にて100μm厚のフィルム状にしたサンプルを、日立製作所(株)製自記分光光度計U-3000形によって測定し、460nm、530nm、630nmの透過率を記載した。評価は透過率0%を◎、3%未満0%以上を○、5%未満3%以

上を△、5%以上は×と記載した。これらの結果を表1に示す。

【0032】表1の結果から、本発明の樹脂組成物が、機械的強度、耐熱性、線膨張係数(寸法安定性)、流動性(成形加工性)、白度、耐熱変色性、光線透過率において、反射板として要求される物性を高水準で満たし、特に光線透過率はガラスファイバーを用いた比較例1~4に比べ大きく低下し、更にPPSやLCP等の他の耐熱性樹脂を用いた比較例5、6では、ベース樹脂自身の色目のために白度が著しく劣っており、本実施例記載の組成物の方が優れていることは明かである。

【0033】

【発明の効果】以上のように、本発明に係る反射板用樹脂組成物は、反射板として所望される各種物性を高水準で満たし、反射板として好適に使用できるという効果を奏する。

フロントページの続き

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